Designation: F2601 – 18

# Standard Specification for Fire Safety for Candle Accessories[1]

This standard is issued under the fixed designation F2601; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

## 1. Scope

1.1 This specification prescribes minimum safety requirements for candle accessories to help ensure a reasonable degree of safety for normal use with candles, thereby improving personal safety and reducing fires, deaths, and injuries.

1.2 This specification is not intended to replace other safety practices such as adult supervision, close monitoring of product when in use, and fire detection, alarm, or suppression systems.

1.3 The values stated in inch-pound units are to be regarded as the standard. The values given in parentheses are for information only.

1.4 *This standard is used to measure and describe the response of materials, products, or assemblies to heat and flame under controlled conditions, but does not by itself incorporate all factors required for fire hazard or fire risk assessment of the materials, products, or assemblies under actual fire conditions.*

1.5 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety, health, and environmental practices and determine the applicability of regulatory limitations prior to use.*

1.6 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

## 2. Referenced Documents

2.1 *ASTM Standards:*[2]

D92 Test Method for Flash and Fire Points by Cleveland Open Cup Tester

E136 Test Method for Behavior of Materials in a Vertical Tube Furnace at 750°C

E176 Terminology of Fire Standards

F1972 Guide for Terminology Relating to Candles and Associated Accessory Items

F2417 Specification for Fire Safety for Candles

## 3. Terminology

3.1 Certain candle-related terminology is addressed in Guide F1972, and the reader is directed to that guide for definitions not found in 3.2 and 3.3. For definitions of terms associated with fire issues, see Terminology E176.

3.2 *Definitions: Candle Accessory Classification Terms:*

3.2.1 *candle accessory, n*—object designed, intended, or marketed for use with a candle.

3.2.2 *candle burner, n*—a candle holder that restricts the free flow of exiting combustion gases.

3.2.2.1 *Discussion*—Candle burners include, but are not limited to, lanterns, potpourri burners, and food warmers. Does not include the item known as a "candle follower", also referred to by the term "candle burner" in the liturgical industry.

3.2.3 *candle holder, n*—candle accessory onto which a candle is placed.

3.2.3.1 *Discussion*—It may support, hold or contain a candle when in use.

3.2.3.2 *Discussion*—Filled candles are not candle holders.

3.2.4 *candle ring, n*—candle accessory intended to surround the candle with decorative materials in proximity to a candle, including, but not limited to, a continuous ring or loose fill material.

3.2.5 *food warmer, n*—a vessel intended to hold food that is heated by one or more candles; it is a type of candle burner.

3.2.6 *potpourri burner, n*—candle burner designed to provide a source of heat to warm a reservoir of extraneous material.

3.2.7 *shade, n*—a candle accessory placed above the candle, whose function is to modify light from the flame and change the appearance of the candle.

[1] This specification is under the jurisdiction of ASTM Committee F15 on Consumer Products and is the direct responsibility of Subcommittee F15.45 on Candle Products.

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[2] For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

3.2.8 *topper, n*—vented candle accessory, which is placed directly on top of a container candle, to modify airflow.

3.3 *Definitions: General Terms:*

3.3.1 *barrier technology, n*—a functional design element of a candle accessory that minimizes the risk of ignition of the combustible components of the candle accessory as a result of foreseeable misuse or failure of the candle.

3.3.1.1 *Discussion*—Precautions should be taken in barrier technology designs to prevent ignition of combustible components. During intended use, the candle should not be capable of igniting combustible components from either heat transfer or direct flame impingement. Accessories should also be designed to prevent ignition of combustible components in reasonable and foreseeable situations such as in drafts or the candle falling over. Examples include a durable, noncombustible wall, or space absent of combustible objects.

3.3.2 *burn cycle, n*—the length of time a candle burns from when it is lit to when it is manually extinguished or from when it is lit until it extinguishes on its own at end of useful life.

3.3.3 *burn time, n*—time a material supports sustained flaming combustion after removal of the ignition source until all flaming ceases.

3.3.4 *consumption rate, n*—rate at which a candle is consumed.

3.3.4.1 *Discussion*—In this specification, consumption rate is measured in ounces (grams) of fuel consumed per hour.

3.3.4.2 *Discussion*—Consumption rate is determined by weighing a candle prior to burning and then again at the end of the life or burn cycle of the candle. The weight consumed in ounces (grams) is then divided by the burn time in hours to arrive at a consumption rate in ounces (grams) per hour.

3.3.5 *diffusion flame, n*—a type of flame where the fuel is not premixed with air or other oxygen source.

3.3.5.1 *Discussion*—Diffusion flames are typically red, yellow, or orange in color.

3.3.6 *flame height, n*—the length of the candle flame from the base to the tip.

3.3.7 *ignition, n*—initiation of flaming combustion.

3.3.7.1 *Discussion*—The combustion is typically evidenced by glow or flame. The combustion may be sustained or transient.

3.3.8 *noncombustible, adj*—not capable of igniting and burning when subjected to a fire under specified conditions.

3.3.8.1 *Discussion*—Materials that pass Test Method E136 are considered noncombustible.

3.3.9 *sustained flaming, n*—existence of flame on or over the surface of the specimen for periods of 4 s or more.

3.3.9.1 *Discussion*—Sustained flaming starts at the beginning of the period when a flame is found on or over the surface.

## 4. Safety Requirements

4.1 *Safety Requirements for Flammability:*

4.1.1 This safety requirement applies to candle accessories intended to be used in direct contact with burning candles. See X1.1.

4.1.2 Specifically this safety requirement applies to candle rings, candle holders, candle shades, candle toppers, and candle burners.

4.1.3 Accessories exempted from this requirement include:

4.1.3.1 Accessories constructed exclusively of noncombustible materials,

4.1.3.2 Accessories constructed exclusively of live plants or fresh cut flowers, or both, that remain hydrated during their intended life,

4.1.3.3 Birthday candle holders that can hold only one candle, do not contain pyrotechnics, and are not intended to move.

4.1.3.4 Accessories that incorporate barrier technology (see 5.2.3.13).

4.1.4 *Performance Requirement*—When tested in accordance with the test method in 5.2:

4.1.4.1 The accessory shall have a burn time less than or equal to an average of 30 s for three tests per component and the burn time for any one test shall not exceed 60 s.

4.1.4.2 During any test, flames shall not spread over the entire accessory.

4.1.4.3 The test shall be conducted on all applicable components of the accessory.

4.2 *Safety Requirements for Candle Burners Performance:*

4.2.1 This safety requirement applies to all candle burners. See X1.2.

4.2.2 *Performance Requirement*—When tested in accordance with 5.3:

4.2.2.1 All candle burners which have the capability of accepting multiple types or multiple quantities of candles, or both, shall be labeled as directed in 6.1.

4.2.2.2 The candle shall exhibit no secondary ignition.

4.2.2.3 The candle shall have no flame height greater than 3.0 in. (7.6 cm).

4.2.2.4 The burner shall not catch fire.

4.2.2.5 Neither the burner nor the candle container shall break or crack as a result of the test.

4.3 *Safety Requirements for Tealight and Taper Candle Holders:*

4.3.1 This safety requirement applies to candle holders not tested in accordance with 5.3 that are intended to use tealight or taper candles. See X1.3.

4.3.2 *Performance Requirement*—When tested in accordance with 5.4:

4.3.2.1 All holders which have the capability of accepting multiple types or multiple quantities of candles, or both, shall be labeled as directed in 6.1.

4.3.2.2 The candle shall exhibit no secondary ignition.

4.3.2.3 The candle shall have no flame height greater than 3.0 in. (7.6 cm).

4.3.2.4 The holder shall not catch on fire.

4.3.2.5 Neither the holder nor the candle container shall break or crack as a result of the test.

4.4 *Safety Requirements for Stability:*

4.4.1 This safety requirement applies to all accessories intended to be used in direct contact with burning candles. See X1.4.

4.4.2 *Performance Requirement*—When tested in accordance with 5.5:

4.4.2.1 The accessory shall not tip over when placed at a minimum 10.0° (–0.0° / +0.5°) incline from horizontal when tested with the candle specified in 5.5.3.2.

4.4.2.2 Asymmetrical accessories shall not tip over at any position when rotated around the vertical axis.

4.4.2.3 Holders labeled in accordance with 6.2 shall be tested with the maximum size candle(s) specified on the label.

## 5. Test Methods

5.1 *General:*

5.1.1 *Safety Hazards*—**Warning—**There is an inherent risk of working with and around open flames.

5.1.1.1 Use appropriate personal protective equipment and practices that ensure a safe work environment.

5.1.1.2 Keep fire suppression equipment nearby that is capable of mitigating fires associated with candle accessory fire safety testing.

5.1.2 *Precision and Bias*—No information is presented about the precision or bias for any of the test methods in Section 5.

5.2 *Accessory Flammability Test Method:*

5.2.1 *Summary of Test Method:*

5.2.1.1 Components of candle accessories are tested on a flat, noncombustible surface through contact with the flame source for up to 60 s.

5.2.1.2 Each test is monitored for sustained flaming combustion of the component. Three separate tests are performed on each type of component of the accessory. The burn time of each test is measured and recorded.

5.2.2 *Apparatus:*

5.2.2.1 Large, flat, noncombustible surface.

5.2.2.2 *Flame Source*—A butane diffusion flame intended to represent a candle flame. The burner tube consists of a stainless steel tube with an outside diameter of nominally 5⁄16 in. (8 mm) and a wall thickness of 5⁄128 in. (1 mm). The gas supply system consists of a pressure gauge, flow meter, fine-control valve, and cylinder regulator providing an outlet pressure of 0.4 psi (28.5 mbar). The flow meter supplies butane gas at a constant rate of 2¾ $in.^3$/min (45 mL/min) at 77°F (25°C). Under the specified conditions, the flame height is approximately 1⅜ in. (35 mm).

5.2.2.3 An alternative flame source is permissible provided that it can be demonstrated by testing identical specimens with both the alternative flame source and the flame source specified in this test method that the tests using the alternative flame source yields failing results as often as, or more often than tests using the specified flame source. See X2.1 for further information.

5.2.2.4 Ring stand/clamp assembly.

5.2.2.5 Stopwatch.

5.2.2.6 Noncombustible measuring device graduated in inches (millimeters), such as a ruler.

5.2.2.7 Thermometer.

5.2.2.8 Hygrometer.

5.2.3 *Procedure:*

5.2.3.1 Condition the accessory before testing for at least 4 h at a temperature between 68 and 86°F (20 and 30°C) and a relative humidity of less than or equal to 55 %.

5.2.3.2 Test the accessory:

*(1)* In a burn test area that will be environmentally controlled to between 68 and 86°F (20 and 30°C) and a relative humidity of less than or equal to 70 %.

*(2)* Within 1 h of being removed from the conditioning atmosphere.

*(3)* In an area with minimal disturbance of the flame source and sufficient size to accommodate the accessory and prevent oxygen starvation of the flame source.

*(4)* On a surface constructed of a noncombustible material that is cleaned before conducting each test, removing charred and molten materials or other debris from previous tests.

5.2.3.3 Test the accessory in an orientation typical of the product's intended use.

*(1)* Place the candle rings on the test surface such that it lays flat to simulate normal use with no free-flowing air space under the accessory unless that is how the candle ring is designed.

*(2)* Position candle shades and toppers like they would be used on a candle.

5.2.3.4 Test the accessory in all orientations and configurations that it is designed or advertised to be used in. The accessory fails the performance requirement if it fails in any of the orientations tested.

5.2.3.5 Ignite and apply the flame source to each unique component, piece, and material on the accessory. See X2.2 for further information.

5.2.3.6 Keep the flame source stationary during the ignition period with the flame source at a downward angle between 15 and 45° from horizontal. See Fig. 1.

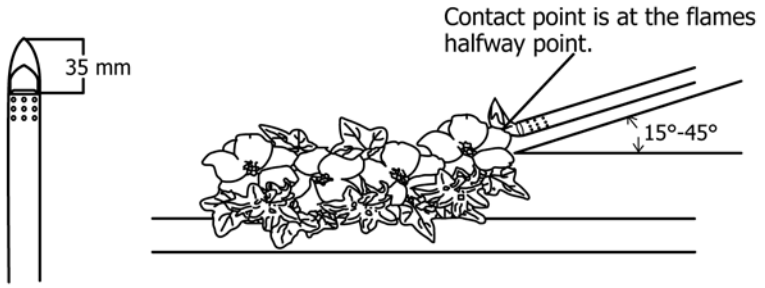


**FIG. 1 Flame Source Positioning**